

CLAIMS

What is claimed is:

1. An untwisted polyethylene yarn comprising: a plurality of filaments in essentially parallel array and about 0.5 to 5 weight percent of a water-dispersible binder material covering less than half the surfaces of said filaments; said yarn having a tenacity greater than about 17 grams/denier and a tensile modulus greater than about 300 grams/denier as measured by ASTM D2256, fewer than about 20 entanglements/meter in a scoured state, and having a width satisfying the following formula

$$10 \quad W \leq 0.055\sqrt{d}$$

where W is the yarn width in millimeters under a tensile load of 0.01 grams per denier measured on a flat surface, and d is the yarn denier.

2. The yarn of claim 1, wherein the yarn width satisfies the following formula

$$W \leq 0.040\sqrt{d}.$$

- 15 3. The yarn of claim 1, wherein the water-dispersible binder material forms about 0.5 to 3 weight percent of the yarn.
4. The yarn of claim 1, having fewer than about 10 entanglements/meter.
5. A woven fabric comprising in majority portion the yarn of claim 1.
6. The woven fabric of claim 5 in a scoured state.
- 20 7. A ballistically-resistant woven fabric of claim 5 having at least 5% greater specific energy absorption when impacted with a 9 mm FMJ bullet at its V50 velocity than a woven fabric having the same construction using polyethylene yarns having the same tenacity and tensile modulus but having more than 20 entanglements/meter or being twisted.
- 25 8. A ballistically-resistant woven fabric of claim 6 having at least 5% greater specific energy absorption when impacted with a 9 mm FMJ bullet at its V50 velocity than a woven fabric having the same construction using polyethylene yarns having the same tenacity and tensile modulus but having more than twenty entanglements/meter or being twisted.
- 30 9. In a process for the preparation of untwisted polyethylene yarns comprising a plurality of filaments in essentially parallel array, said yarn having a tenacity greater than about 17 g/d, a tensile modulus greater than about 300 g/d, and

fewer than 20 entanglements/meter: the improvement comprising applying about 0.5 to 5 wt.% of a water-dispersible binder material so as to cover less than half the surfaces of the filaments during a last drawing step under a tension of greater than about 2 grams/denier.

- 5 10. In a process for the preparation of a very low creep, ultra high modulus, low shrink, high tenacity multifilament polyethylene yarn by:
 - a) drawing a high molecular weight polyethylene yarn at a temperature within 10°C of its melting temperature to form a drawn, highly oriented polyethylene yarn;
 - 10 b) then poststretching said yarn at a drawing rate of less than about 1 second⁻¹ at a temperature within 10°C of its melting temperature, and cooling said yarn under tension sufficient to retain its highly oriented state; the improvement comprising applying to the yarn about 0.5 to 5 weight percent of a water-dispersible binder material so as to cover less than half the surfaces
 - 15 of the filaments during one of drawing step a) or poststretching step b) under a tension greater than about 2 grams/denier.
11. The process of claim 9 wherein the water-dispersible binder material is a member selected from the group consisting of a salt of an acrylic copolymer, sodium carboxymethyl cellulose, polyethylene oxide, polypropylene oxide, ethylene oxide/propylene oxide copolymers, polyvinyl alcohol, modified starch, esterified starch, cationic starch, starch-styrene/butadiene copolymer, and mixtures thereof.
- 20 12. The process of claim 10 wherein the water-dispersible binder material is a member selected from the group consisting of a salt of an acrylic copolymer, sodium carboxymethyl cellulose, polyethylene oxide, polypropylene oxide, ethylene oxide/propylene oxide copolymers, polyvinyl alcohol, modified starch, esterified starch, cationic starch, starch-styrene/butadiene copolymer, and mixtures thereof.
- 25 13. A process for the preparation of a ballistic-resistant fabric comprising the steps of:
 - a) weaving a fabric comprising in majority portion the yarn described by claim 1; and

- b) flattening and spreading the yarns in said fabric by additionally applying one or both steps selected from the group consisting of scouring said fabric and calendering said fabric.
- 14. The process of claim 13 wherein said flattening and spreading step comprises scouring said fabric.
- 15. The process of claim 13 wherein said flattening and spreading step comprises calendering said fabric.